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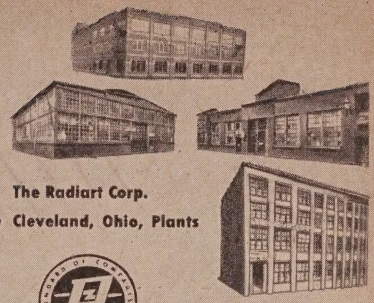

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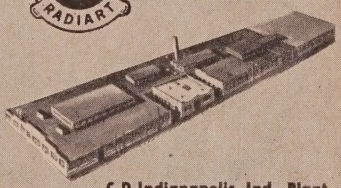

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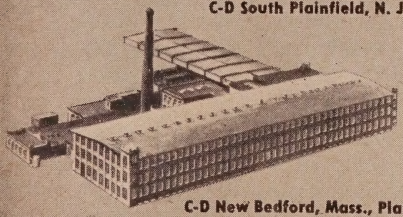

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Vol. 19 JULY, 1954 No. 7

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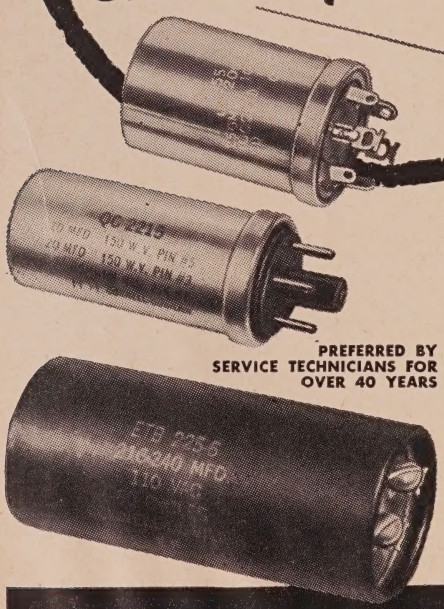

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DIELECTRIC AMPLIFIERS

The **dielectric amplifier** is one of the promising tubeless devices which have appeared in recent years. It is known also as the capacitor amplifier, since its active element is a special form of a 2-plate capacitor. In many respects, it can be considered the dual of the magnetic amplifier, since voltage in the dielectric amplifier behaves somewhat like current in the magnetic amplifier. Unlike the magnetic amplifier and the transistor, however, the dielectric amplifier has high input impedance similar to the vacuum tube with which it promises to compete.

In addition to high input impedance, the dielectric amplifier has other advantages. It is simple and compact, nonmicrophonic, and can be constructed to withstand considerable mechanical abuse. Its small size favors subminiaturization of equipment. The dielectric amplifier can be operated at higher frequencies than some magnetic amplifiers and most conventional transistors. It can amplify power as well as voltage, and can provide considerable gain in some circuits. Its main disadvantages are its temperature dependance and its need for a high-frequency power supply.

Although the dielectric amplifier at present is in the developmental stage, it appears to be an inexpensive device which will be relatively simple to manufacture. Its useful life should be unlimited unless the device is abused. Both alone and in conjunction with tubes, transistors, or magnetic amplifiers, the dielectric amplifier promises to play an important role in electronic equipment of the future. Materials are available for dielectric amplifier experiments, and even the experimenter and hobbyist now can construct these amplifiers.

The heart of the dielectric amplifier is a small 2-plate ceramic capacitor having special characteristics that will be described later in this article. This simple device operates without the filament and vacuum of the electron tube, the critically-spaced contacts of the transistor, or the critical metals of the magnetic amplifier.

In order to understand how the dielectric amplifier works, it is necessary to examine the phenomenon of **ferroelectricity**. To many readers, this will be a strange term.

Capacitance and Ferroelectricity

A simple formula for the capacitance (C) of a capacitor having two identical plates, each of area A, separated by a dielectric material having a dielectric constant K and thickness t, is $C = KA/4.45t$. Here, C is in micromicrofarads, t in inches, A in square inches, and K is a number expressing the dielectric constant.

For illustration, consider two metallic plates ½ inch long and ¼ inch wide separated by a sheet of mica 1 mil thick. In this case: $A = 0.5(0.25) = 0.125$ sq. in., $t = 0.001$", and we obtain from a table of dielectric constants a value of 7 for the K of mica. Therefore, $C = (7 \times 0.125)/(4.45 \times 0.001) = 0.875/0.00445 = 197$ uufd.

Now, if the mica separator is removed and the 1-mil separation is maintained, 1/1000 of an inch of air is the only insulator between the plates. The dielectric constant (K) of air is 1. So the capacitance becomes $C = (1 \times 0.125)/0.00445 = 28.1$ uufd.

Finally, assume that a 1-mil thickness of a ceramic dielectric with a K of 1000 is inserted between the plates. Now, $C = (1000 \times 0.125)/0.00445 = 0.028$ microfarad.

These calculations serve to show that for a constant plate size and separation, the capacitance varies **directly** as the dielectric constant of the material between the plates. Thus, from the

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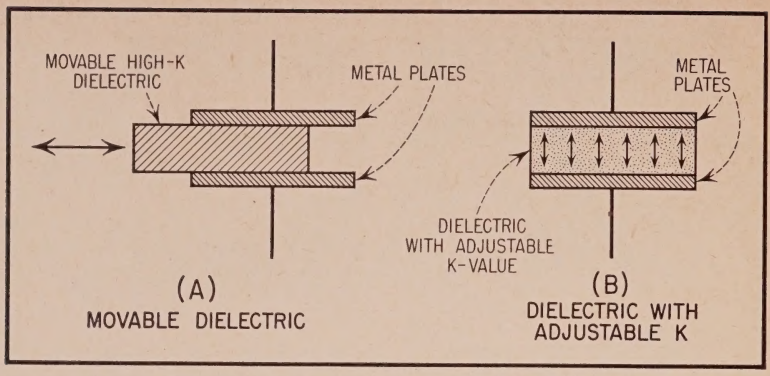

Fig. 1. Principle of Dielectric-Variable Capacitor.

preceding examples, it is seen that a simple 2-plate air capacitor of 28.1 uufd. becomes a 0.028-ufd. unit (1000 times higher capacitance) when a thin slab of ceramic with a K value of 1000 is inserted between the plates. A simple mechanical concept of a type of variable capacitor then might be a 2-plate unit in which the dielectric slab might be slid in and out. While this simple picture might not be entirely accurate, it will serve to illustrate the point that **the capacitance of a "fixed" capacitor can be varied if some means is provided for varying the dielectric constant of the material separating the capacitor plates.**

This concept of a dielectric-variable capacitor is illustrated in two ways in Figure 1. The high-K dielectric material is mechanically moveable, as by sliding, in Figure 1(A). Maximum capacitance occurs when the dielectric is completely between the plates, and minimum capacitance when it is removed entirely leaving only air as the plate separator. In Figure 1(B), the position of the dielectric material is fixed, the latter being completely between the plates at all times. But some means is provided, preferably electrical, for changing the K of this material at will. The arrows on the dielectric are intended to indicate this variable-K feature. The result obtained in both cases is approximately the same. It is only the method of accomplishing a capacitance via a change in dielectric constant that is different.

Another point which should be made here is that the reactance (or, if you prefer, impedance) of the capacitor varies in the opposite direction with these changes in dielectric constant. Thus, for a constant operating frequency the reactance increases as K decreases, and vice versa.

Mention was made earlier of high-K ceramic dielectric. A number of ceramic materials have high dielectric constants, often reaching values of several thousand. Examples are barium titanate, strontium titanate, and other titanates and zirconates which contain combinations of barium, strontium, lead, magnesium, etc. Ceramic capacitors are examples of practical components employing these dielectric materials to provide large capacitances in small-sized units.

Such high-K materials are important also in dielectric amplifier applications because the dielectric constants of some of them vary with the strength of an applied voltage. A characteristic of that kind is, of course, undesirable in a ceramic capacitor used in conventional circuits, since a capacitor is

not expected to change its value when the voltage changes. But we shall see that it is this very characteristic which is found in **some** ceramics which is the basis of dielectric amplification. A voltage-sensitive dielectric might be employed, for example, in Figure 1(B).

Dielectric materials which exhibit the property of voltage sensitivity are said to be **ferroelectric.** Such dielectrics are also described as non-linear for reasons explained later. In these materials, the dielectric constant decreases as the applied voltage increases.

The mechanism of ferroelectricity cannot be completely explained in any simple manner, since many references necessarily must be made to advanced mathematics and theoretical physics. But, as in the case of numerous other electronic devices, an elementary picture of ferroelectricity can be presented which is entirely satisfactory for a good working acquaintance with the phenomenon.

The explanation can be introduced by mentioning that dielectrics happen to be non-conductors of electricity because they have no free electrons (or at least only infinitesimal numbers of them) to contribute to current flow. Virtually all of the electrons are bound tightly within the atoms of the material. But a charge applied to a dielectric will strain the atoms, distorting their shapes, as the atomic electrons are pulled toward the positive electrification. Atomic distortion is greatest in the high-K materials. It also is constant in "conventional" dielectrics, but varies with the charging voltage in the non-linear dielectrics. The strained atoms are **electric dipoles** and are analogous to the magnetic dipoles in a magnetic material. In the dielectric material, electric dipoles are lined up by the applied charge in a manner similar to the alignment of magnetic dipoles in a magnetic material.

A charge will align a certain number of electric dipoles in a given high-K dielectric material. However, doubling

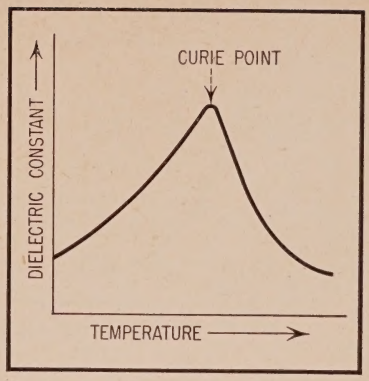

Fig. 2. K-vs.-Temperature Characteristic.

the applied voltage will not necessarily line up twice as many dipoles. This reveals a non-linear relationship between the applied voltage and the number of aligned dipoles and accounts for the term "non-linear dielectric" which is applied to such materials.

Two interesting properties characterize voltage-sensitive, non-linear dielectrics. One is temperature dependence. Figure 2 shows how the dielectric "constant" of a high-K dielectric might vary with temperature. Note that K increases with temperature up to a maximum value at a particular temperature. This peak is termed the **Curie point.** Beyond this point, K decreases with further increase in

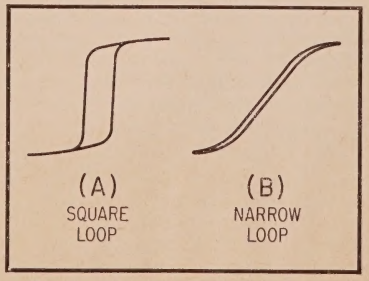

Fig. 3. Dielectric Hysteresis Loops.

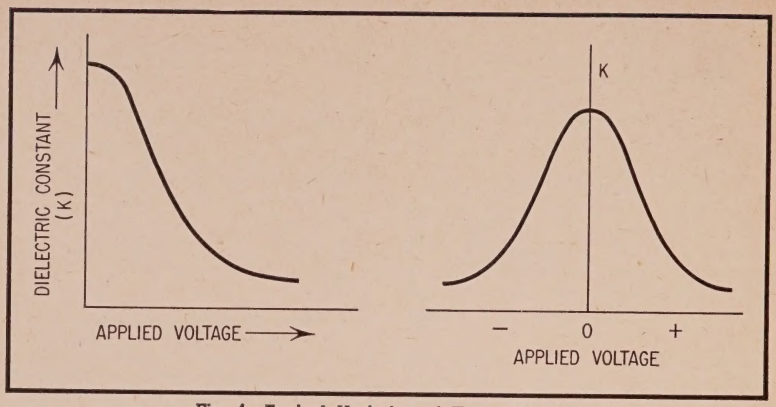

Fig. 4. Typical Variation of K vs. Voltage.

temperature. The composition of some non-linear dielectric materials is chosen such that the Curie point occurs at or near room temperature. The other property is the hysteresis loop inherently associated with these dielectrics. Figure 3 shows two types of hysteresis loops which might be obtained from the application of a complete positive and negative voltage cycle. It will be noted that these resemble the hysteresis loops of magnetic materials. The "square" loop (Figure 3A) characterizes the more lossy type of dielectric, while the narrow loop of Figure 3(B) is associated with low-loss material. The latter type of loop is desirable in dielectrics which are to be used in amplification.

Figure 4 shows how the value of dielectric constant, K, might vary with applied voltage in a hypothetical dielectric. Note that K decreases as E increases. This might also be a plot of capacitance vs. voltage. A few practical electronic technicians have chanced to notice that a small drop in capacitance, somewhat similar to this illustration although not as pronounced, occurs in some high-capacitance ceramic capacitors when d. c.-biased near maximum rated voltages.

Control Action with Ferroelectric Components

When a capacitor is connected in series with a high-frequency generator and a load resistance of appropriate size, the load current (and the voltage drop across the resistance) will be proportional to the reactance of the capacitor. If the generator frequency and voltage are held constant, the output voltage drop can be varied across the load resistance by varying the capacitor.

If a non-linear capacitor is substituted in the circuit, output-voltage variations may be obtained by varying the dielectric constant of the capacitor with a control voltage. The effect can be made quite pronounced by d. c.-biasing the non-linear dielectric to a point along the steep part of its curve (Figure 4).

Figure 5(A) shows a simple control circuit illustrating this principle. The high-frequency generator may be an r. f. oscillator. The d. c. bias, E_{dc}, sets the "no-signal" capacitance of the non-linear capacitor to a suitable point on its K-vs.-voltage curve. The lower-frequency control signal is applied through the radio-frequency chokes, RFC, which block the passage of high-frequency currents into the low-frequency source.

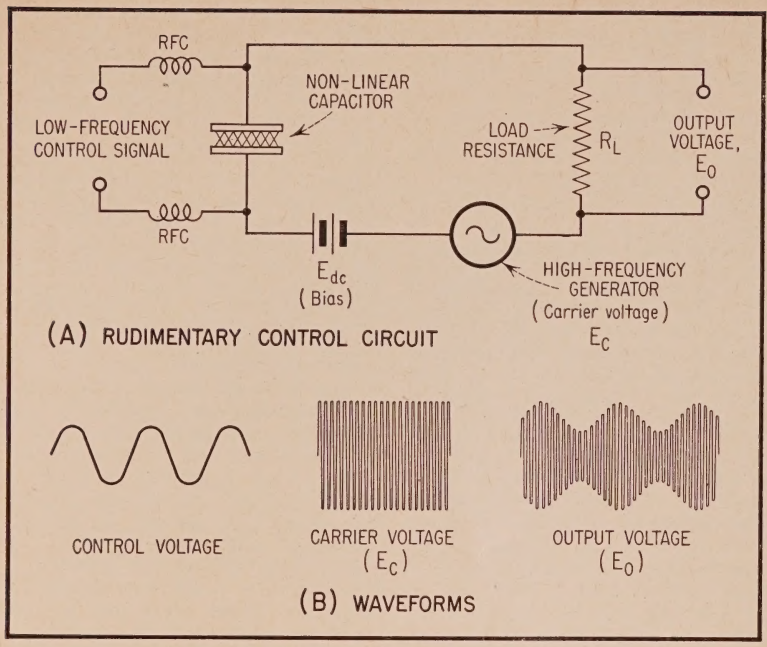

Fig. 5. Control Circuit Operation.

As the control-signal voltage goes through its alternations, it changes the dielectric constant, and therefore the reactance of the non-linear capacitor, proportionately, above and below the no-signal level. This fluctuating reactance then causes proportional changes in the output voltage E_o. Figure 5(B) shows the resulting signal waveforms. The control signal essentially is a voltage, and little or no power is taken from its source. The output component, on the other hand, can represent appreciable power. Thus, gain is provided by the circuit, since a large amount of power is controlled with a small amount. The control-signal frequency and waveform may be recovered by rectifying E_o.

Dielectric Amplification

In the circuit of Figure 5, the d. c. bias can be adjusted for operation along the steep, linear portion of the dielectric curve. Considerable variation in reactance then will result from a small change in control-signal voltage. Under these conditions, the output voltage and power can be much higher than the control signal. Thus, amplification can be obtained. Figure 5 is, in fact, an elementary dielectric amplifier circuit.

Best results are obtained when the carrier frequency is appreciably higher than that of the control signal. A satisfactory choice is when the carrier is 10 times the control frequency.

For optimum reactance of the non-linear capacitor, the carrier usually is chosen to be a radio frequency, and is supplied by a vacuum-tube oscillator. In practice, an r. f. power supply of this type can be made as simple as the d. c. rectifier-type supply used with v. t. amplifiers.

Figure 6 shows a somewhat different type of circuit, developed by A. M. Vincent.[1] Here, two non-linear capacitors and two linear capacitors are connected into a 4-arm bridge circuit. Since the bridge is balanced, no carrier current reaches the input-signal source. Like all bridge circuits, however, voltage divider action is inherent and the output voltage is reduced.

In the audio amplifier in Figure 7, the non-linear capacitor is made part of a radio-frequency tuned circuit. In this case, L_1 is tuned to the frequency of the carrier generator by the linear capacitor (C_2) and the non-linear capacitor (C_3) in series. C_2 functions to prevent short circuit of the d. c. bias through L_1. Alternations of the small input-signal audio voltage vary the reactance of C_3 and shift the tuning of the L_1 tank up and down, with respect to the carrier frequency. This results in a modulated output wave, similar to E_o in Figure 5. The modulated r. f. power is coupled out of the tank through L_2 which may be a low-impedance secondary. The audio envelope is recovered by means of the demodulator diode, D. This simple circuit is capable of useful gain.

The largest variations in tank circuit tuning, corresponding to highest gain, will be obtained when the selectivity characteristic of the tuned circuit is steep. This calls for high Q in C_2, C_3, and L_1. In practical applications, C_2 and C_3 are kept low in capacitance, and the carrier frequency made not less than 100 kc. for good audio reproduction. Amplifier stages of this type can be cascaded by using the output of diode D to drive the non-linear capacitor in the following stage. The same carrier generator may be employed as a common power supply to all stages.

The same scheme can be employed in radio-frequency amplifiers if the carrier is made at least 10 times the maximum frequency to be amplified.

Shaw and Jenkins[2] have shown a 2-stage dielectric amplifier of a similar type with a power gain of 30 db, operating with 0.3 mw input and delivering 300 mw output. Silverstein[4] reports power gains up to 10,000 per stage.

Vincent[1] also has reported a successful radio receiver, consisting of

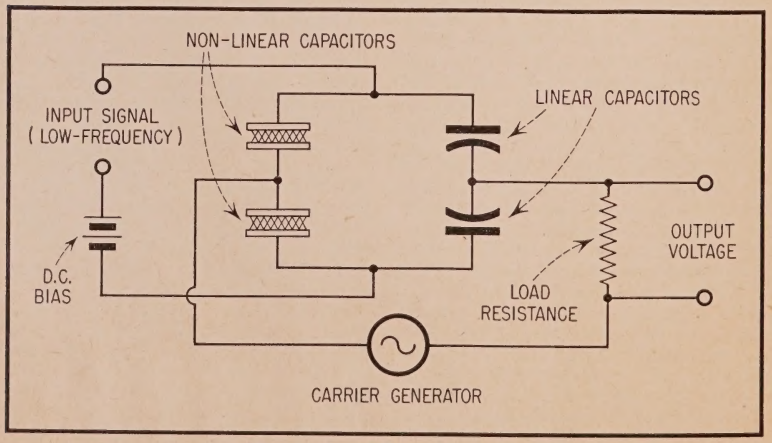

Fig. 6. Bridge-Type Amplifier.

a crystal detector followed by two cascaded pushpull dielectric amplifier stages which drive a loudspeaker.

While professional opinion places dielectric amplifiers in the developmental stage at the time of this writing, they presently are practical enough for the experimenter to derive much enlightening experience from their construction and operation.

Capacitors to be used for amplification are fabricated in the same manner as some silvered mica and ceramic components — that is, silver electrodes are painted on the faces of the non-linear ceramic and the material then fired. It is possible to obtain thin sheets of the material already silvered and to cut it into small capacitors for experimentation. The characteristics of the material, obtainable from the supplier, determine the levels of d. c. bias and carrier voltage employed.

Suppliers of Non-Linear Dielectrics

The experimenter will be interested in the following list of companies now able to supply non-linear ceramic dielectrics suitable for use in dielectric amplifiers.

1. Gulton Manufacturing Co., Metuchen, N. J.
2. Glenco Corp., Metuchen, N. J.

Bibliography

1. **Dielectric Amplifier Fundamentals,** A. M. Vincent. ELECTRONICS, December, 1951., p. 84.
2. **Non-Linear Capacitors for Dielectric Amplifiers,** George S. Shaw, and James L. Jenkins. ELECTRONICS, October, 1953, p. 166.
3. **Non-Linear Dielectrics,** Norman Rudnick. A publication of the Glenco Corporation, Metuchen, N. J.
4. **Building and Using Dielectric Amplifiers,** Abraham Silverstein. ELECTRONICS, February, 1954, p. 150.
5. **Introducing the Dielectric Amplifier,** James S. Fink. RADIO-ELECTRONICS, February, 1954, p. 92.

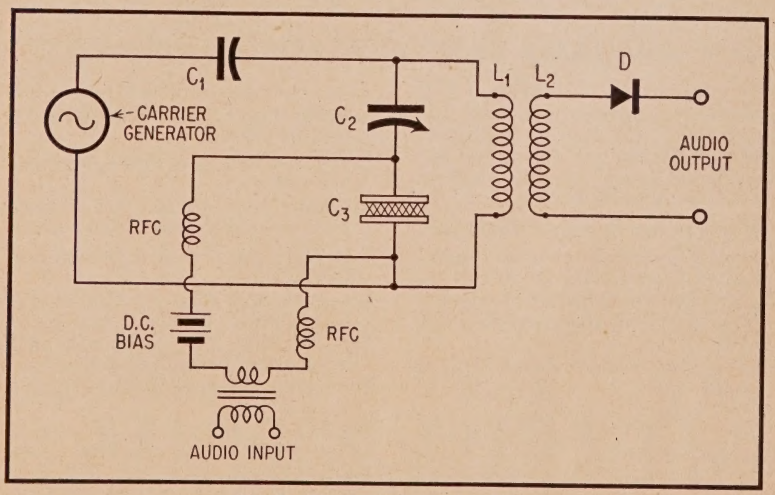

Fig. 7. Dielectric Audio Amplifier.

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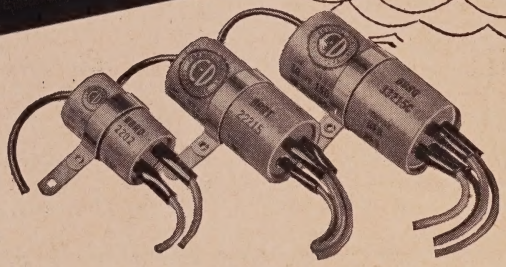

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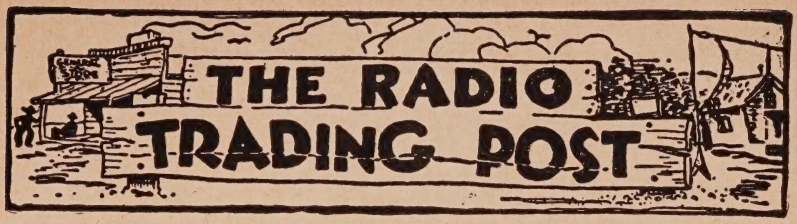

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WANTED — Complete set of Sams manuals. Give price and numbers of same. Redd's Radio and TV Repair, Box 12, Union Furnace, Ohio.

FOR SALE — 4 University PH reflex trumpets with MA-25 driver units; 2 RCA 12214 50 w. amps.; Rauland 196A 10 w. amp., all exc. cond., no reasonable offer refused, all or part. Thomas R. Dunn, 153 Harrison Ave., Somerset, Mass.

FOR SALE — Hickok 288X sweep sig. gen., $95. Will accept Precision E-200-C sig. gen. as part payment. Heath voltage calibrator $8.50. John A. Kimm, 934 Judson St., Evansville 13, Ind.

WANT — Commercial 2 meter converter, coax relay, Heathkit AT-1 transmitter, unwired. Will trade radio items of equal value. G. Samkofsky, 527 Bedford Ave., Brooklyn 11, N. Y.

SELL OR TRADE — Fairchild 541A recording head and advance ball attachments; Command receiver 7-9 Mc.; GE self-powered phono pre-amps; meters, etc. Bill L. Godden, 8718 East 77th Terrace, Hickman Mills, Mo.

WANTED — Test equip., tubes, resistors, condensers, Sams Photofacts, Riders manuals, tools, steel cabinets, TV antennas, sig. gens., tube testers, scopes, also load checkers. Send list. Will pay cash. Frank Kesto, RD 1, North Rose, N. Y.

FOR SALE — 3AP1 and 3BP1, misc. oil condensers from 600 to 10,000 v.; 6.3 v. transformers to 10 amps.; misc. power transformers to 2,500 v. Lexington Electronic Laboratory, 3 Sunny Knoll Ave., Lexington, Mass.

WANTED — 3-speed changer, tape puller and head for tape recorder. Will swap personal plane receiver-transmitter, GE type AS1-B or amateur mobile or high power transmitting parts. R. McClure, 106 Wadsworth Rd., N. Syracuse, N. Y.

SELL OR TRADE — Professional Federal recorder model 12LP1, 2-speed, overhead lathe, cuts 120 lines per inch, two mike inputs, phono input, built-in AM radio; 2-speed Eicor tape recorder model 115. Want cameras and photo equip. W. D. Bridge, 832 Negley Ave., Evansville, Ind.

FOR SALE — L. n. tape recorder; Brush Soundmirror model BK-401; extra output circuit for external amp., exc. quality, $90. Vincent Pellettieri, 5523 31st Ave., Long Island 77, N. Y.

FOR SALE — Norelco 22" projection console, $175; Tele-King model KC14 21" console, $210; Heath 5" scope, $37.50. All l. n. Also used Stromberg-Carlson 12" combination TV and FM radio. Television Tech. Service, Webster Park Place, Spring Valley, Ill.

FOR SALE — National NC-183 receiver, exc. cond., matching speaker and N. B. F. M. adapter, $175 no shipping. Wm. J. Engle, Jr., 4264 N. Bodine St., Philadelphia 40, Pa.

FOR SALE — Riders radio manuals, 1 thru 20, l. n., $60 cash, FOB. Wm. E. Krah, 367 Main St., Manchester, Conn.

SELL — 0-1 amp. Weston RF ammeter $5; Triplett model 421 (4" square) 0-1 milliampere DC meter $5; SW-3 receiver with 20, 40 and 80 meter coils, $20; Philco battery operated sig. gen., $8. M. G. Weiman, 4514 Ave. K. Brooklyn 34, N. Y.

SELL OR SWAP — Novice: WAT-25 transmitter, WAR-25 receiver, WAP-25 power supply — all complete, like new and assembled; gold wrist watch and expansion band. Need cash or good receiver. Cliff Bennett, 94 Westfield Rd., Holyoke, Mass.

FOR SALE OR SWAP — Johnston outboard 110 v. AC motor, all channel all-direction antenna, '46-'48 Dodge radio, 2 portables. Need UHF converter, Eico condenser tester, Finco 400A antenna, TV tubes and components. Karl Nester, Van Meter, Pa.

FOR SALE — Heathkit tube tester with new roll chart in good cond., tests all new type tubes, $22. D. T. Willis, 1404 S. Jackson, Tucumcari, N. M.

WANTED — Service manual and schematic for Vomax 900, Sams Photofacts 10, 11, 12, 15 to 30, 32 to 37, 52, 53, 55 to 88, 90 to 109. Send list and prices. Five Points Radio and TV, Box 111, Hampton, S. C.

FOR SALE — Code practice oscillator $3 postpaid, use with earphone and 90 v. battery. Selling out. Send stamp for list of radio parts and tubes. C. Stout, 2241 E. Broadway, Muskegon, Mich.

FOR SALE — Millen 50 w. transmitter-exciter, No. 90800, never used, complete with 40 meter coils, $25. Charles Stouth, Box 378, Secane, Pa.

FOR SALE — Factory wired l. n. Eico 315 Deluxe sig. gen., $30; Supreme 504-A tube and set tester with latest roll chart and adaptors for TV tubes, $25. Spitz, 1420 South Randolph, Arlington, Va.

SELL — Well-established radio and TV Service business, including tubes and parts. Only radio and sales with repair work in town, 5 miles to St. Joseph, Mo., residence attached. E. Kiehnhoff, Box 355, Wathena, Kan.

FOR SALE — Heathkit C-3 condenser checker, l. n., $15; Torkmaster model 948 time switch, 30 a., 115 v., 60 cycle, $4; $1500 Snaider Auditorium P-520 projection TV, 20" x 26" picture, good cond., $198. N. Forcier, Essex St., Middleton, Mass.

TRADE — Knight 20 w. Hi-Fi amp., and 15" speaker, both l. n., for 40-50 w. phone transmitter such as Lettine. Prefer local deal. W. B. Williams, 914 S. Franklin St., South Bend 18, Ind.

SELL OR SWAP — Latest model Heathkit 6 w. amp for good tube tester, VTVM, condenser and resistor tester. S. Strangle, Trout Creek, Mich.

SELL — Meissner Ex-signal shifter de-TVI'd per QST, 10 to 80 meter band switching, 5 w. output $50. Green, 51 Elmira St., Hicksville, L. I., N. Y.

SWAP — Complete mobile rig, 10 meters, 40 w. home-brew Xmtr, Triband rcvr., whip and mount, PE-103, vibrator, mike, etc., for good tape recorder mechanism or FM tuner. Rick Gould, 12254 Montana Ave., West Los Angeles 49, Calif.

SWAP — Radio parts for TV, radio test or workshop equip. J. Cemarata, 30 Lilac Drive, Syosset, N. Y.

FOR SALE — Hickok 288X sig. gen.; Heathkit 0-8 oscillograph; NRI radio and TV comm. course, complete with kits. All good cond., make offer. A. Cuomo, 778 North Oak Drive, Bronx 67, N. Y.

TRADE — Hallicrafters SX-28 with bass reflex speaker, in perf. shape, new tubes and aligned on all bands, for National NC-173 receiver in good cond. C. L. Piester, Box 594, Fort Collins, Colo.

SELL OR TRADE — Model 48-700 7" Philco TV; Astatic AT-1 booster; 7 Vols. Coyne's "Applied Electricity", all good cond., for Eico VTVM, tube tester or similar make in good cond. Alvin Schumann, RR 1, Beloit, Wis.

FOR SALE — Books: Terman, Henney, Ghirardi, Audel, College and High School Outlines, Math, Housebuilding, Drafting and others. All exc. cond., recent editions. Stamp for list. Sidney Gross, 17 W. 108 St., Shanks Village, Orangeburg, N. Y.

SELL OR TRADE — Eico 425 scope, hardly used, $50; Sprague KT-1 capacitor checker, l. n., $25. Want test equip., TV or radio tubes and parts, or good typewriter. Frank Truskolaski, Box 493, Adena, Ohio.

FOR SALE — Millen Exciter with power supply, rack-mounted for table; coils 80-10 meters; also NFM-VFO unit 7 Mc. output; Hallicrafters SX-25, RME DB-23 preselector and speaker, $150 no shipping. Robert Hudson, 44 Varnum St., Arlington, Mass.

FOR SALE — Johnson Viking II with Johnson Lo-pass, l. n., $230. Roy Durso, 384 Sackett St., Brooklyn 31, N. Y.

FOR SALE — Riders radio manuals 1 thru 5, $25; 7, 8, 10, 12, $5 each. Good cond. Leitch Television Service, 34 Park Drive South, West Orange, N. J.

WANTED — Lampkin freq. meter type 105A or 105B, complete with manual; Lear Omni-scope, and Lear Omni pack LCP-5. State price, cond., and how long used. E. A. Whitnah, Route 8, Box 245, Little Rock, Ark.

FOR SALE — Riders radio manuals 1-7, RCA manuals 1923 to 1954, Philco manuals and Serviceman 1933 to 1954. Crosley, Motorola, etc., also service notes on various sets. Complete outfit $35. J. F. Riehle, 1642 Cedar Ave., Cincinnati 24, Ohio.

SWAP — Perfect 1C7, 1A7, 6AC7, 6K6, 6SL7, 6J7, 77, 117P7, 7A7, all or any part for 12BE6, 12SQ7, 12SK7, 0Z4, 5Z3, 1U4, 35W4, 6SB7, 6C8, net for net. Arthur Bulmer, 90 S. Main St., Rockland, Me.

FOR SALE — Silvertone 3-band, table model radio, twin speaker, magic eye, pushbutton dial tuning, good working cond., $25. Local preferred. J. Carroll, 1216 Cortelyou Rd., Brooklyn 18, N. Y.

FOR SALE — Rider Chanalyst, never used, model 162C, $50 including instruction book. Bill Hoyle, 235 Hayward St., Yonkers 4, N. Y.

FOR SALE — BC-224L, l. n., converted to 110 v. AC with 8" PM Jensen Hi-Fi speaker and Universal output transformer; also schematic diagram, $85, plus shipping charges. Wm. H. Meyer, 44726 Fig St., Lancaster, Calif.

FOR SALE — Thirteen PA speakers, several types, 25 w. and larger. $225 FOB, cash only. R. B. Thackeray, Box 157, Melvin, Ill.

FOR SALE — Transmitter, 300 w., 2,000 v., 300 Ma. power supply and many other misc. parts and tubes. H. Grottenthaler, 37 Duquesne Ct., Springdale, Pa.

SELL OR TRADE — Philco 49-1075 TV chassis, Taybern TV slave, RCP test equip. Want tape or wire recorder, Instructograph (AC model), Vibroplex bug, typewriter, SBB, Jr. Samuel Ferraro, 5025 54th Place, Hyattsville, Md.

FOR SALE — Car radios, all types, for any car, and also tested and OK'd. Louis DeMarco, 2 Clay St., New Haven, Conn.

FOR SALE — Superior multitester, used one year, $8; Eico sig. tracer, model 145K, $10. Vernon J. Kroh, New Salem, North Dakota.

SELL — Stock of 400 tubes or will trade for 21" TV set (blond preferred), or what have you? L. T. Laugeness, 1012 13th Street North, Moorhead, Minn.

WANTED — Good used Pentron model 9T-3C portable tape recorder. State cond., reasonable price. Glenn L. Shultz, 38 Broad St., Newville, Pa.

FOR SALE — Riders TV service manuals 1 thru 9, l. n., first $90 and FOB charges takes all. Fred L. Kost, 431 Flamingo St., Philadelphia 28, Pa.

WANTED — Navy type L-M freq. meter, also 1000 or 1500 v. power supply. George Leininger, 16412 Marquis Ave., Cleveland 11, Ohio.

SELL OR SWAP — TG10 code machine with mike input and tapes. Good cond., worshop 10 m. beam. Need drill press, jig saw, TV, comm. receiver. L. S. Finnegan, 5335 Wabash, Kansas City, Mo.

FOR SALE — 3 BC-611 Handitalkies, 2 l. n., all for $225. Eddie Barrat, 1012 First Ave., Seattle 4, Wash.

WANTED — 2 vibrator power supplies, Navy type CRF-20221, for Navy model MAB, Paratrooper, Walkie-Talkie. D. L. Johnson, Box 7013, Spokane 18, Wash.

FOR SALE — IRE Proceedings, 1949-'53, incl. Best offer. J. A. Schindler, 38 Walnut Park, Boston 19, Mass.

WANTED — ARC-5 transmitter for 160 meters, NTX-30 transmitter and NSM-30 modulator. Lewis J. Papp, Route 1, Easton, Pa.

FOR SALE — Collins 32V-2, exc. cond., unaltered, with astatic mike T-3 and stand. Best offer over $420; Mark 19 with most accessories, l. n., with dynamotor and instruction books, $20; Rider TV manual No. 1, $5. Roy T. Merkel, 107 Cross St., Little Silver, N. J.

FOR SALE — CQ and QST from Oct. '48 to Nov. '53, good to fair cond. E. Erickson, Box 81, South River, N. J.

FOR SALE — Commercially-built 3" scope, little used, schematic furnished with unit. Kenneth E. Gould, 878 Mill St., Watertown, N. Y.

WANTED — Two RF stage comm. receiver, Code machine and tapes. Also buy or rent testing chart for Superior Instruments Co., model 1240 tube tester. H. F. MacDonald, Box 593, Kodiak, Alaska.

FOR SALE — ¼ HP AC motor, $6; ⅓ HP AC motor, $8; RCP VTVM model 668, $25; E-200-C Precision sig. gen., $50; Eico VTVM model 221, $20; 12½" Transvision TV, $40. Harold Levinson, 6117 81st St., Elmhurst, L. I., N. Y.

FOR SALE — 3 0-1 Ma. 4" meters in orig. boxes, square bakelite cases, knife-edge pointers, VOM scale, 50 ohms internal resistance, $5.50 each postpaid. L. Cohen, 151 - 09 34th Ave., Flushing, N. Y.

FOR SALE — UTC modulation transformer, 300 w. of audio, $30; UTC LS-82 5 v. CT at 20 a., 10,000 v. ins., $5; radio altimeter ARN-1, $9. Send for list. R. G. Pecina, 839 Jersey Ave., Elizabeth 2, N. J.

FOR SALE — Triplett 630 multitester, very good cond., $30. M. D. Locke, 623 Willow Ave., Garwood, N. J.

WANTED — Model DR 200 Monitoradio, must cover 30 to 50 Mc. and 152 to 174 Mc. bands, in trade for Conn B flat Tenor Sax, with case in perf. shape, just overhauled, new pads and cork. Griffin, 4644 Geary Blvd., San Francisco 18, Calif.

WANTED — Obsolete VT (proximity) fuses, should be complete externally; relic artillery and mortar ammunition. Richard L. Parker, 10807 Havenhurst Avenue, Granada Hills, Calif.

WANTED — Chassis of Jesse French radio receiver, Junior model G; also Weston radio set analyzer model 660 in working cond. Carl S. Tunwall, 1520 4 Ave. South, Fort Dodge, Iowa.

WANTED — Hallicrafter S-38 receiver in good cond., state price in first letter. C. L. Bachofer, 939 Woodbine Ave., Rochester 19, N. Y.

SWAP — Pair 4-125's, 832's, 955, 958A, 1642, 9002, 9003, record changers, parts, tubes. Need comm. receiver, Viking or other Xmtr, kit test inst. except scope and VTVM. Need not be working. Donald Anglin, Groom, Tex.

SELL OR SWAP — Dumont 12" TV set, with FM, phono jack, perfect chassis, new CRT; portable typewriter; Meissner AM-SW 9-1034 set; radio parts, magazines, for what have you? Paul Elias, 640 Adee Ave., Bronx 67, N. Y.

SELL OR TRADE — Hallicrafter HT-17 Xmitter, l. n., with 7 Mc. coil and Xtal.; Precision series 40 AC-DC tester with Hi-Lo voltage leads; 16KP4-A picture tube. Would like used Hallicrafter S-40A or S-53 type receiver. Nelson D. Eddy, 25 Jefferson St., Phoenix, N. Y.

TRADE — Dynamotor (28 v. - 250 v.), power transformers, spkrs., condensers, resistors, IF and AF transformers, crystal phones, amp. (operating, needs work), tubes. Want tape recorder, or outboard motor in good cond. P. W. Burrows, 36 Woodridge Circle, Trumbull, Conn.

SELL OR TRADE — Table model Stewart-Warner radio, 5 tubes, exc. cond., about 10 years old. Want typewriter or 16 mm. silent projector, and films. Francis H. Snyder, 2412 11th Ave., Watervliet, N. Y.

FOR SALE — Telivision Library. Send self-addressed envelope for complete list of books and periodicals. Marcus H. Moses, 35 Hamilton Place, New York 31, N. Y.

FOR SALE — 200 feet Federal Type K111 shielded 300-ohm cable, good price. W. H. Anderson, 30 Sycamore St., Windsor, Conn.

WANTED — Solar model CE or CF resistor and condenser tester. Must be in good cond. L. D. Lacey, 920 Ewart Rd., Rt. 1, Akron 12, Ohio.

SELL OR SWAP — Antique tubes, dating back to the beginning of radio. Raymond Fisher, 627 Fallowfield Ave., Charleroi, Pa.

WANTED — Used 10" and 12" table-model TV sets in working cond. Local only. Leon Abramson, 17 Lawrence Circle, Portsmouth, Va.

SWAP — Hallicrafters model T-54 7" TV receiver in exc. cond., all new filters and selenium rectifier, for NRI condenser checker or NRI model 45 VOM. M. W. Driskell, 407 Lauderdale St., Selma, Ala.

WANTED — **Information** on the Meissner 1938 14 tube Traffic Master receiver. L. Marks, 14 Avenue Rd., Kingston, Surrey, England.

FOR SALE — Heath model 06 scope; new tube, resistors, and molded condensers, used very little, complete with instructions, $35; Oak Ridge Cathode Ray tube tester, model 106, $21. George J. Schalk, Jr., 1973 Fulton St., Brooklyn 33, N. Y.

FOR SALE — English Collaro 3-532 3-speed automatic changer, never used, 105-125 v. AC, complete with 45 RPM spindle, dual plug-in heads with GE RPX-050 cartridge, flip crystal cartridge. All sapphires. Will sacrifice, $45 prepaid. M. Wiener, 320 Morris Ave., Bronx 51, N. Y.

WANTED — Elmac A54 or H, or Gonset Commander, with mobile power supply. Will swap Royal Quiet Deluxe typewriter, Jackson dynamic tube tester, model 637, with built-in multitester. J. Brownston, 5629 El Granero Way, Sacramento, Calif.

FOR SALE — Eico 470 7" scope, factory wired with 3 Eico factory wired tester leads, all for $110; also Sprague Kwik Test condenser checker, l. n., $30. F. C. Yaunk, 3108 Ave. H, Fort Madison, Iowa.

FOR SALE — Hickok 288X crystal controlled sig. gen.; Hickok 195 scope. Make offers. John Sharp, 48 Miles St., Millbury, Mass.

SALE — Bud cabineted 40-80 meter 45 w. CW transmitter, includes coils, Triplett milliammeter, two power supplies; NC-33 comm. rcvr., exc. cond.; Lettine 240, tuner, all coils, $100. Spencer Dubov, 3100 Brighton 2nd St., Brooklyn 35, N. Y.

WANTED — Rek-O-Kut model M-5S Master-Pro 16" overhead recording mechanism for standard and microgroove recording. L. J. Schnedorf, 610 Monroe Ave., River Forest, Ill.

WANTED — Any make 7" TV set, must be in good running condition. Harold Smallpiece, 252 Pembroke St. W., Pembroke, Ontario, Can.

WANTED — Good used two-way radio (mobile) suitable for LCC on 152 Mc. band. Cash for good equip. J. W. Jackson, 1700 NE. 49th, Portland, Ore.

TRADE — Mallory UHF converter, used very little, good as new, for camera or radio tester. G. E. Stowers, 2020 East 48 Terrace, Kansas City, Mo.

SWAP — Receiving tube stock, sufficient for starting a business, for factory made ham transmitter. L. M. Tyler, 4110 Hayden St., Amarillo, Tex.

FOR SALE — Browning RV-10A tuner, Pickering 132E record compensator, Chicago BO-6 output trans., H. H. Scott Dynaural noise suppressor type 111-A, all l. n. Make offers. Maxwell Strange, 673 Colrain Rd., Greenfield, Mass.

FOR SALE — Complete Sams Photofact folder-sets: 87, 90, (97A-97), 104, 113, 126, 145, 171 — 75 cents plus postage, or $1 postpaid. Earl W. Wells, 223 North Philadelphia St., Shawnee, Okla.

FOR SALE — (3) RCA Orthicon 5820; (2) portable radar transmitters - receivers, model SN, input 110 v., 60 cycles, 153 pounds, range 300 yards to 25 miles. Irving Mower, TV. Engineering Co. of Maryland, 4257 Park Heights Avenue, Baltimore 15, Md.

FOR SALE — 1951 Ford deluxe radio, No. 1A-18805-A1, with speaker, mounting brackets and hardware. Guaranteed l. n. cond., $30 or best offer. Baltimore-Washington area. H. Butterworth, 2708 Gaither St., SE, Washington 20, D. C.

WANTED — Complete set of Sams Photofacts, also 6 v. and 12 v. battery eliminator. Milton E. Wrenn, 310 First Street SE, Moultrie, Ga.

FOR SALE — Regency RC-53 UHF converter, new cond., $10 postpaid. R. P. McClintock, 4325 Wyoming St., Kansas City 11, Mo.

FOR SALE — Riders manuals 1-5, 6 thru 13, complete, good cond., $70; BC-610 exciter deck, $15; BC-453 receiver, $15; BC-457 transmitter $12.50. W. F. Montgomery, Jr., 3958 Baltic St., Jacksonville 10, Fla.

WANTED — Back issues of C-D Capacitor from 1937 to 1953 inclusive. State what you have and I will make offer. J. N. L. Daoust, 4195 Seminole Rd., Windsor, Ontario, Canada.

WANT — Crystal calibrator-monitor, part of TBX-7. Can use almost any quantity. York Marine Radio, Stonington, Conn.

SELL OR SWAP — 289 photography magazines, 18 varieties (original value $86). Need scope, battery eliminator, sig. gen. William H. Strack, 47 Churchill Road, Haddonfield, N. J.

FOR SALE — Silver 701 transmitter, schematic, all coils, 80 to 6 meters, $30; also SX25, $65. Local only. H. I. Griffiths, 39 - 82 65 Place, Woodside 77, L. I., N. Y.

WANTED — Meissner 9-1091C Deluxe AM-FM Hi-Fi radio tuner, used auto license plates, any state or country. Bob Ward, "Darjeeling," Box 214-A, Schwenksville, Pa.

SELL OR TRADE — K&E drawing set model 946 and others, Post model 1452P slide rule, Anchor TV booster, Precision 912P tube tester, BC-645 transceiver, auto radios. Want oscillators, audio, AM, FM, TV, ham equip., etc. C. E. Junkins, Jr., RFD, Holyoke, Mass.

WANTED — C-D Capacitor, Vol. 1, No. 2 and 4 of 1937; Vol. 3, No. 7 to 12 of 1939; also QST's for March, May, July, 1916. J. J. Simpson, 85-39 152nd St., Jamaica 32, N. Y.

FOR SALE — Hickok 610 with test leads and manuals; Audel's new automobile guide book. Best offer, FOB. W. S. Phillips, 1107 Fulton Road NW, Canton 3, Ohio.

SELL OR TRADE — 16" Crosley TV console 10-429, needs repair, with mahogany cabinet, $25, or trade for Eico or Heath tube tester in good cond. Local only. Martin Levy, 799 Thornhill Dr., Cleveland 8, Ohio.

SELL OR TRADE — 2 wire-recorder basic machines Sears-Roebuck type, each with mike, bias osc., phono pickup. One slightly used. $25 each or will trade for scope, 8 x 10 view camera or photo gear. John Pere, 2143 Pressler Rd., East Akron 12, Ohio.

FOR SALE — E-200-C Precision sig. gen., coax cable and SSS book, $50; Eico 360K sweep gen., factory calibrated, built-in dual crystal calibrators, 4.5 Mc. internal, variable external, 4.5 Mc. crystal, cable and instruction book, $45. L. J. Kamienski, 134 East Whitehall, Northlake, Ill.

FOR SALE — Heath sweep and marker gen., model TS1A, $15. John Sibick, 326 Dolph St., Jessup, Pa.

FOR SALE — Heath models 0-6 5" scope,, and 1B-1 C-R-L impedance Bridge (copy of General Radio 640-A) at $49.50 and $75.50 each, respectively, FOB. Wired, latest modifications, l. n. J. P. Neil, 1567 College Ave., Palo Alto, Calif.

WANTED — Coils for SW-3 National rcvr., RF and detector coils — 30A—10 meter, 31A—20 meter, 33A—40 meter. D. Guptill, 17 Park St., Medford, Mass.

INFORMATION NEEDED — The IF freq. of the Philco-made Signal Corps radio receiver and transmitter, model BC-659-H-4878:CGG. Contact us at once. NOBO Company, 429 High St., West Medford, Mass.

FOR SALE — Sprague 'Kwik-Test" model KT-1, $30; Sprague Telohmike, model TO-4, $60, both l. n. Superior CA-12 sig. tracer, model CA-12, $12. Stephen Plauski, 425 3rd St., Brooklyn 15, N. Y.

WANTED — 30-50 Mc. and/or 152-174 Mc. FM receivers or converters, 110 v. AC or 6 v. DC, mobile, tunable or crystal for police and fire department use. Write details. R. L. Evans, Jr., Box 156, Ambler, Pa.

SELL OR TRADE — Nuclear scaler, Atomic Instruments model 101; all types Geiger tubes; survey meters: Victoreen 263 beta-gamma, $160 and 356 alpha, $180. All good operating cond. Want Collins 75A2 or 75A3 receiver. P. M. Reyling, Route 2, Concord, Tenn.

FOR SALE — Fine novice transmitter, using 6AG7 and 1625 tube, complete with power supply, antenna coupler, and 80-meter Folded Dipole Antenna, $50 FOB. Frank W. Jones, Gabbs, Nev.

FOR SALE — RA-34G Rectifier, metered variable DC output, 1,000 v. at 350 Ma., 12 v. DC at 2.4 amp., 12 v. AC at 14.5 amp., 115-230 v., 60 cycle input, $100 FOB. Joseph H. Stefanik, 504 Grace Ave., Garfield, N. J.

FOR SALE — "Vacuum Tubes", Eastman, $2.50; "Communication Engineering", Everitt, $1.95; "Applied Mathematics", Smith, $2; "Applied Mathematics — Physicists", Pipes, $3.75; Audels "Electric Motors", $2; "Radio Operating Questions, Answers", $1.95; "Calculus Refresher", Klaf, $2; all 1. n., $15. Signal, Turnerville, New Mexico.

WANTED — Precision ES500A scope and 10-12P tube tester. G. W. Winter, 13416 Sherry Ave., Cleveland 11, Ohio.

TRADE — 6L6-807 Xmitter and power supply for 10 meters; Motorola 7" table TV (tubes OK needs work), misc. parts. Want FM tuner, Hi-Fi amp., camera. Joe Svientek, 8215 East Nada, Downey, Calif.

SELL OR SWAP — 32 v. Delco plant, Riders manuals, meters, movie equip. Want mobile rig, typewriter, jet pump and tank. Joseph Leeb, 1380 Merriam Ave., Bronx 52, N. Y.

FOR SALE — —Elincor 400 EA 10-meter 3-element beam antenna, all aluminum and uses folded dipole as driven element, ladder completely assembled, $7.50. Local sale preferred. Samuel T. Chase, 19 Kafka Dr., Dunellen, N. J.

FOR SALE — Back issues of "Proceedings of the I.R.E." Mostly between 1947 and 1953, copies available at 75 cents each. Carl Solomon, 35 Rainbow Lane, Levittown, N. Y.

FOR SALE — Unused Heathkit V-6 VTVM, and Eico 625K tube tester, wired and tested. Simpson 260 almost new. Best offer FOB. R. H. Hanson, 1511 East Larpenteur Ave., St. Paul 6, Minn.

FOR SALE — Best offer takes Hallicrafters Littlefone Radio Telephone. Like new, complete with shoulder carry and battery charger. Also Millen 2-6-10 meter transmitter with tubes. A. Tamburino, 111 South Crescent Drive, Rome, N. Y.

WANTED — Experienced radio and TV serviceman only. Must be sober and furnish references. Permanent job to the right man, with chance for advancement. Butler Electric Co., 120 North Bay Street, Eustis, Fla.

SELL OR TRADE — Skybuddy receiver with built-in transmitter; Hallicrafters 7" TV in operating cond.; BC-453 Q5'er, broadband converter for ten meters, misc. meters. Need Heath Audio Gen., electronic switch or test equip. M. E. Hall, Webster Rd., Route 1, Berea, Ohio.

WANTED — Manuals and diagrams for Triplett model 1200 AC DC meter and model 1620 tube tester, F. A. Cornelius, 1315 P.O., Galveston, Tex.

FOR SALE — Hallicrafter SX-17 rcvr., reasonable. Louis F. Steinmetz, 872 Amboy Ave., Fords, N. J.

TRADE — Complete set Sams TV folders and Eicor model 15 tape recorder for a 2¼" x 3¼" Pacemaker and a 4" x 5" Speed Graphic camera in good cond., clean and fully equipped. Excel Photo Service, 123 S. 13th St., Clarinda, Iowa.

WANTED — National Comm. receiver NC-125, NC-183D or HRO-60. Must be in like new cond., and reasonable. L. J. Schnedorf, 610 Monroe Ave., River Forest, Ill.

FOR SALE — G.I. model RC130L 2-speed disc recorder changer unit with magnetic cutter and pick-up, $45; 3-tube pre-amp and photo control unit, $30; 5BP4 CR tube, $7; RCA ribbon mike, KB2A, $75. John Thiel, 1003 N. Denver, Tulsa, Okla.

WANTED — Purchase or swap for standard equip., all types government surplus, tubes, components equip.; especially BC-348, BC-312, BC-342, AN/ARC-1, AN/ARC-3, AN/ART-13, RTA-1B, BC-221, BC-1000, BC-1306, selsyns, synchros, servo motors, amplidynes. Lectronic Research, 715 Arch St., Philadelphia 6, Pa.

URGENTLY NEEDED — APR-4 items. New high prices. Also need other APR-, APS-, ARC-1, ARC-3, ART-13, BC-348, BC-221, etc.; TS-12, 13, 35, 45, 120, 146, 155, 173, 174, 175, 323, other "TS-", particularly microwave equip.; manuals, meters, parts, cable. Littell, Farhills Box 26, Dayton 9, Ohio.

SELL OR SWAP — For tube tester, GE rotary converter model 31122 compound wound 115 v. DC to 60 cycles AC. Bopp's Garage, Box 38, Brussels, Ill.

FOR SALE — NRI communications course transmitter, power supply, and mike. Peter Sauro, 412 Woodside Ave., Newark 4, N. J.

TRADE OR SELL — Riders 7-13; Chanalyst; Sams 1-10 asst. service data; 10" table model TV; 10" floor model TV, both in good operating cond. Newton Center Radio Shop, 759 Beacon St., Newton Center 59, Mass.

FOR SALE — National Co. Hi-Fi 10 w. phono amp.; Webster model 55 record changer; AM tuner T.R.F. 4 tuned stages; FM Pilotuner model T-601; 12" Stromberg speaker 25 w. in cabinet. Best cash offer for complete set-up. Roger Shaw, Box 802, New Bedford, Mass.

WANTED — TV and radio tubes, UHF converters and Hawaiian guitar. Also swap issues of "Technician" for issues 1 and 3. Ben Mueller, Nash Rd., North Tonawanda 2, N. Y.

FOR SALE — RCA BC-474A, 75 and 80 VFO transmitter and receiver, CW or phone, tuning network and RF ammeter built in, $55. Herbert Greenberg, 821 Rutgers Rd., Franklin Square, N. Y.

SWAP — New Eico 425-K scope and Eico 360-K sweep gen., for 16" or larger used TV set. O. J. Ballard, Center, Neb.

WANTED — Used Lampkin model 205 modulation meter. Write description and price. C. L. Pattee, Salem, Mass.

WANTED — Astatic D104 mike. Will sell Telrad 18A freq. standard. Best offer. Joseph A. Stauhs, 105 Carpenter St., Belleville, N. J.

SELL OR SWAP — 35 ohm coax, perfect match for mobile whip — weatherproof 3/16 OD 15 to 30 ft. lengths. Also used BNC coax connectors. D. C. Harrington, 2508-B 36th St., Los Alamos, N. M.

WANTED — Cabinet from Hallicrafter SX42 or SX62. Will pay cash, state cond. and price. E. S. Bednar, 81 Lincoln Ave., Carteret, N. J.

SELL OR SWAP — Scott receiver: 15 tubes, all chrome plated, 4-bands, power supply, speaker, new tubes. Will take NC-200. C. M. Lang, 3619 Riverside Ave., Cleveland 9, Ohio.

FOR SALE — Heath scope (factory test), tube checker, TV alignment gen., sig. gen., condenser checker, bar gen., VTVM, HV probe, 1 to 11 TV manuals, VT course — 10 kits and lessons. Best cash offer. Laurence Bertold, 926 Cunningham St., Rockford, Ill.

FOR SALE — Custom built multitester, large knife pointer, 2500 v. AC; 5 to 1000 v. DC; 10 - 500 Ma.; 100 to 10 megs. Battery and AC powered. Minus case and batteries. Edmund Bendheim, Box 146, Lincolndale, Westchester County, N. Y.

FOR SALE — Hi-Fi TRF tuning unit with AVC and tuning eye, $36.50; Pentron tape recorder $135. Willia Hintz, Route 4, Hutchinson, Minn.

SWAP — GE, Beede, Weston 3" round meters, asst. ranges; DeArmond guitar mike with volume control; T-17 mike; Thord and UTC power Xmfrs. Want to go mobile, what have you got? A. Bonavita, 34 Highland Ave., Newark 4, N. J.

FOR SALE — Radio test equip. John McHugh, 451 East 135th St., New York, N. Y.

WANTED — Two or more 2B6 tubes. Advise cost. F. K. Haynes, Box 1671, Miami 10, Fla.

FOR SALE — Electronic dimmer control for Olds, 6 v.; Howard SW receiver. W. E. Fuller, 4620 Stafford Rd., Lansing, Mich.

FOR SALE — Ten 5" dynamic speakers $10; Teletone TV portable model 318 $35, Admiral model 105 changer, furniture cabinet, $10; Temple combination model 617, $10; 8" speaker $5. Paragon Radio Service, 170 - 26 Jamaica Ave., Jamaica 3, N. Y.

FOR SALE — Complete mobile rig, including: Leece-Neville 8.0 amp alternator with regulartor, shunt, and ammeter; Elmac 54H 50 w. transmitter, with dynamic mike; Morrow converter with noise limiter; PE103 dynamotor; Sky Master antenna 20 and 75 meter coils. P. B. Summers, 410 Maple St., Delphos, Ohio.

FOR SALE — Triplett 3413-A tube checker with picture tube adapter; Weston multitester (3 meters); inventory of radio receiving tubes, or trade for home (AC) power unit, or what have you? Eddie's Cadillac Service, 159 N. 6th St., Newark 7, N. J.

MUST SELL — Local preferred: BC-224, power supply, speaker exc.; ARC 5(807) relay power supply; 274N for 10 meters; Underwood portable Universal; VTVM; Motorola Xmitter; Instructograph and tapes; BC-375 tuner. V. Algin, 107 Abbott St., Staten Island 5, N. Y.

C-D's Blue Beaver

- The only electrolytic capacitor designed and built *specifically* for servicemen.
- 50% *"safety factor"* — makes allowance for changes in set caused by previous servicing, aging of components, etc.
- Elimintes costly comebacks. Millions in use!
- Write for Catalog 200C, Cornell-Dubilier Elec. Corp., South Plainfield, N. J. Your local Classified Phone Directory lists your nearest C-D jobber.

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Printed in U.S.A.